

**TWO NEW SPECIES OF *EOSENTOMON* FROM
CHICKASAW STATE PARK, TENNESSEE
(PROTURA, EOSENTOMIDAE)**

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Abstract.—A study of 140 soil and leaf litter samples from Chickasaw State Park, Hardeman County, Tennessee resulted in the collection of four previously described species of Protura and two new species. The previously described species were: *Eosentomon montanum* Copeland, *E. pallidum* Ewing, *E. wheeleri* Silvestri and *Styletoentomon rostratum*. The two new species are described and named *Eosentomon chickasawensis* and *E. hunnicutti*.

During June of 1964 and 1965 Mr. George Hunnicutt collected 140 soil and leaf litter samples from Chickasaw State Park, Hardeman County, Tennessee. The samples were processed through modified Berlese funnels and individuals of the order Protura were sorted from other arthropods and prepared for study. Several species of Protura were found in the samples. Among these were four previously described species, viz., *Eosentomon montanum* Copeland (1964), *E. pallidum* Ewing (1921), *E. wheeleri* Silvestri (1909), and *Styletoentomon rostratum* Ewing (1921). In addition, two forms were found which had not been recognized by Copeland (1964) and appear to be undescribed species. These two forms are described and named in this paper: *Eosentomon chickasawensis* and *E. hunnicutti*. The terminology used in describing these species agrees with that of Tuxen (1964) with the exception of PR, which was determined by dividing the length of the pseudoculus into the total length of the head including the labrum.

***Eosentomon chickasawensis*, new species**

Figs. 1-10

Holotype. Female. Slide GSH 132-9: Chickasaw State Park, Tennessee, June 1965, G. Hunnicutt. Type Deposition: United States Natural History Museum, Washington, D.C.

Paratypes. 33♂♂ 26♀♀. One specimen sent to each of the following collections and/or individuals: American Museum of Natural History, New York, USA; Gentaro Imadate, Tokyo Medical and Dental University, Konodai College, Chiba, Japan; Yin Wen-Ying, Shanghai Institute of Entomology, Academia Sinica, Shanghai, China; S. L. Tuxen Collection, Zoologisk Museum, Universitetsparken 15DK 2100 Copenhagen, Denmark; 55 paratypes retained in the University of Arkansas Insect Collection, Entomology Department, University of Arkansas, Fayetteville, Arkansas, USA.

Etymology. The species is named for the area in which it was collected, Chickasaw State Park, Tennessee.

Description. HEAD: Head capsule slightly longer than wide (109:97 microns).

Labrum (Fig. 1) 13 microns long, with a broad, apical, V-shaped notch and a semilunar shaped apodeme proximal to the notch. Labral setae present. Rostral setae I winged basally, extending to the tip of the labrum. Rostral setae III shorter than rostral setae I (10:14). Mandibles with three teeth each. Lacinia I and II hooked distally. Clypeal apodemes prominent and connected anteriorly. Tentorium distinct, maxillary ramus broader than the cardo. Head ratios: PR 245:13 = 18.8; LR 218:27 = 8.0.

THORAX: Mesothoracic seta *P 1* (Fig. 2) inserted on the sclerotized portion of the notum and shorter than the distance to its corresponding primary (13:23) on the opposite side. Seta *P 1'* inserted on the unsclerotized portion of the notum and slightly longer than its corresponding primary (15:13). The terminal bulbs of *filamento di sostegno* in the prothorax.

TARSI: Foretarsus (Figs. 3, 4) short and broad, 78 microns long and 23 microns wide at broadest part. Sensillum *t 1* (Fig. 3) possessing a large club, short shank, and inserted slightly proximal to $\alpha 3'$. Sensillum *t 2* lanceolate or very narrowly clavate, with a long shank and inserted on the level of $\alpha 4$. Sensillum *a'* broad, lanceolate-clavate, its length less than the distance to *t 2* (10:14). Sensillum *b' 1* absent. Sensillum *b' 2* lanceolate, inserted on the level of γ and extending to the insertion of *t 3*. Sensillum *s* with a small club, less than twice the width of its shank. Empodium subequal to the unguis and slightly clavate. Sensillum *e* (Fig. 4) inserted on the level of $\beta 6$ and with a huge club longer than its shank. Sensillum *g* inserted proximal to $\beta 8$ and in line between $\beta 8$ and $\gamma 4$, possessing a huge club that is longer than the shank. Sensillum *f 1* setiform. Sensillum *a* distinct and extending two-thirds the distance to $\gamma 2$. Sensillum *b* short but length equalling the distance to $\beta 6$. Sensillum *c* with a long slender club only slightly broader than its shank and its tip on the level of pit II. Tarsal ratios: EU 27:31 = 0.87; BS 90:64 = 1.40.

Metathoracic tarsus (Fig. 5) possessing a short empodium and the unguis with no teeth.

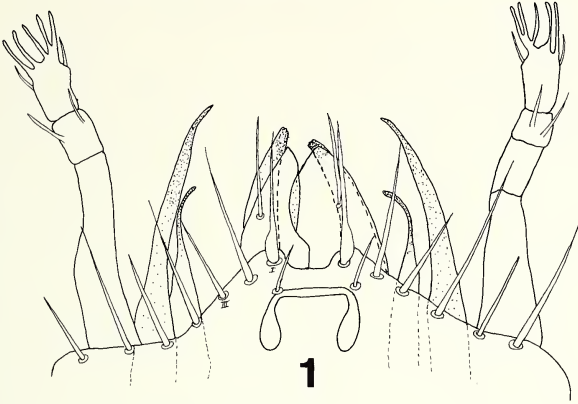
ABDOMEN: Posterior row of setae on tergum I (Fig. 6) with three primary setae, one accessory seta, and one microchaeta on each side. Setae *P 1* on tergum IV (Fig. 7) much shorter than *P 1'* (31:49). Setae *P 1'* on tergum VII (Fig. 8) filamentous and inserted midway between a line drawn connecting the *p 1-P 2* and the posterior edge of the tergum. Sternum VIII (Fig. 9) possessing two anterior and seven posterior setae. Sterna IX and X (Fig. 9) with six setae each. The abdominal chaetotaxy is shown schematically in Table 1 with the figure above the dash representing the anterior row and the figure below the dash representing the posterior row.

GENITALIA: The female squama genitalis (Fig. 10) shows no unusual features.

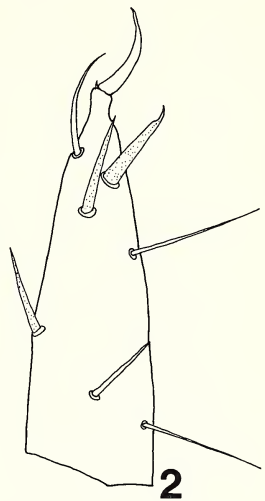
Discussion. Twenty-one females and thirty-two males were examined. No variation was found in: (a) the 2-7 arrangement of setae on sternum VIII, (b) the length of the

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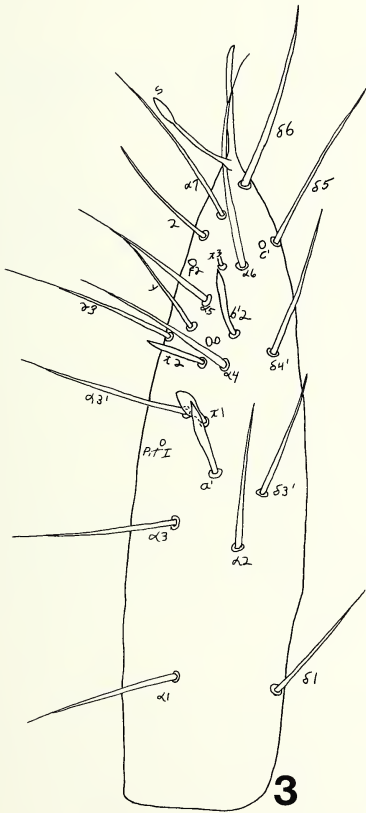
Figs. 1-4. *Eosentomon chickasawensis*. 1. Labrum and anterior portion of head. 2. Tarsus III. 3. Foretarsus (dorsal view); setae and sensilla as indicated. 4. Foretarsus (ventral view); setae and sensilla as indicated.



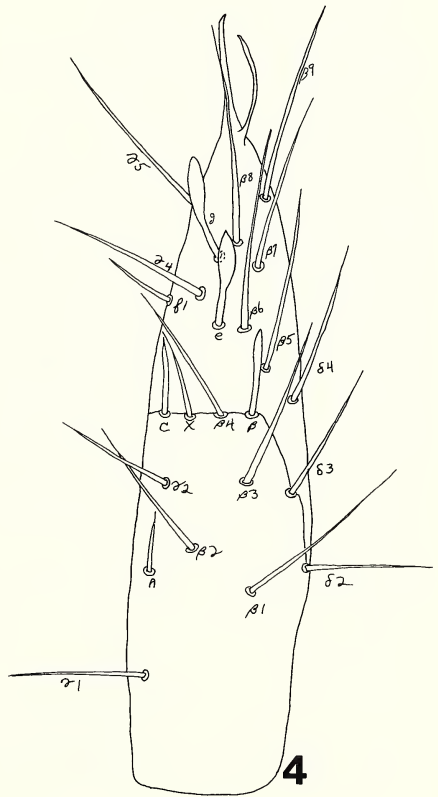
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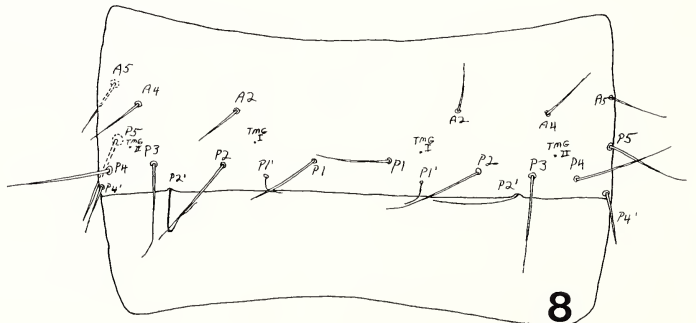
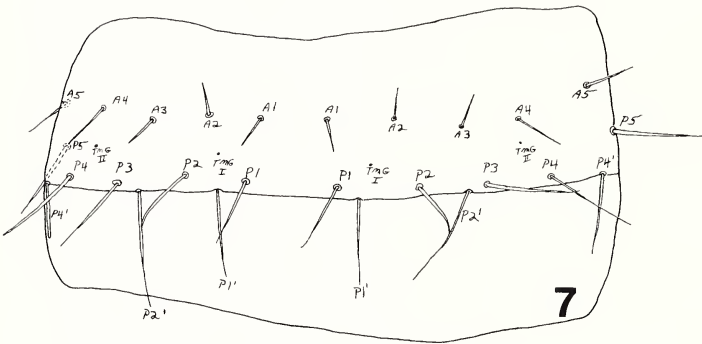
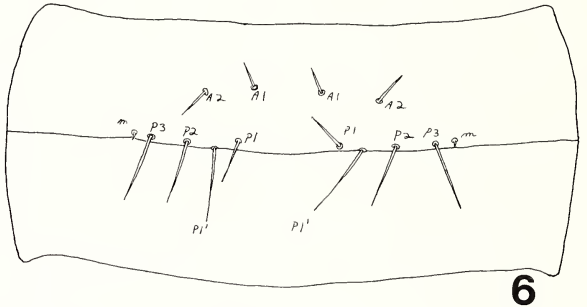
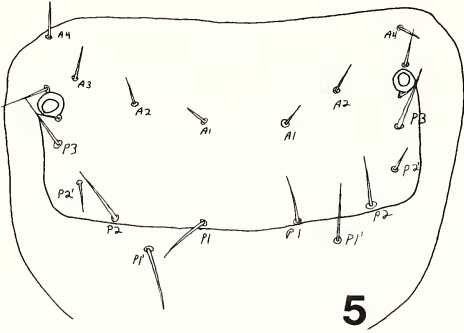
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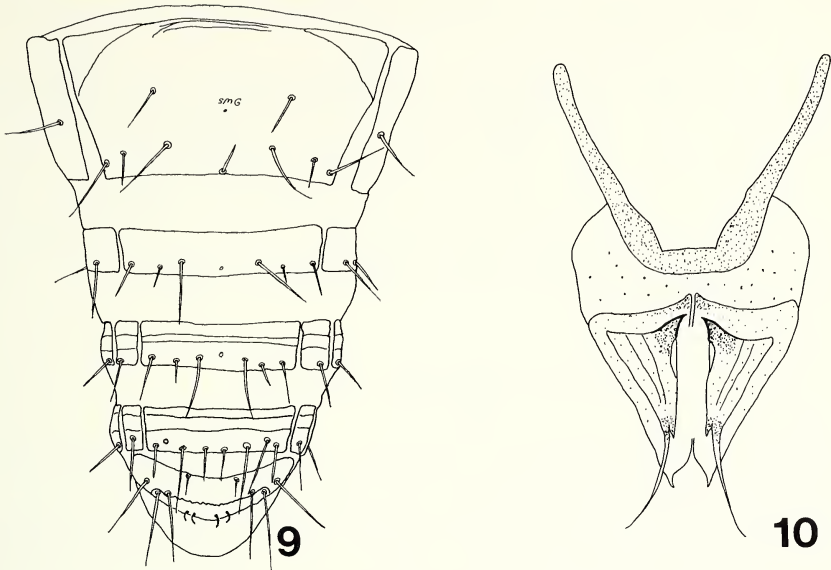


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Figs. 9, 10. *Eosentomon chickasawensis*. 9. Sterna VIII–XII; SMG, sternal microgland pores. 10. Female genitalia.

primary setae much less than that of the accessory setae on tergum IV, (c) sensillum *t 1* inserted a little proximal to $\alpha 3'$, (d) length of sensillum *a'* less than the distance to the insertion of *t 2*, and (e) sensillum *f 1* setiform. Nine individuals were oriented in such a manner that it could not be determined whether rostral setae I were winged or not.

This species possesses two anterior and seven posterior setae on sternum VIII. This places it in the *wheeleri* group of Bonet and Tuxen (1960). It also belongs to the 3:1:1 subgroup proposed by Copeland (1962) because of the presence of three primary setae, one accessory seta and one microchaeta on each side in the posterior setal row on tergum I. Within the 3:1:1 subgroup *E. chickasawensis* and the other new species described in this paper, *E. hunnicutti*, seems to be most closely related to *E. pusillum* Ewing. This new species differs from *E. pusillum* in that sensillum *t 1* is inserted closer to $\alpha 3'$ than to $\alpha 3$.

Distribution. Known only from the type locality, Chickasaw State Park, near Bolivar, Hardeman County, Tennessee.

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Figs. 5–8. *Eosentomon chickasawensis*. 5. Mesothorax; A1–A4, setae of the anterior row; P1–P3, setae of the posterior row. 6. Abdominal tergum I; A1–A2, setae of the anterior row; P1–P3, setae of the posterior row; M, microchaeta. 7. Abdominal tergum IV; A1–A5, setae of the anterior row; P1–P5, setae of the posterior row; TMG, tergal microgland pore. 8. Abdominal tergum VII; A2–A5, setae of the posterior row; TMG, tergal microgland pore.

Table 1. Schematic representation of the abdominal chaetotaxy of *Eosentomon chickasawensis*.

Abdomen	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Tergum	$\frac{4}{10^a}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{6^b}{16}$	$\frac{6}{9}$	8	8	8	9
Sternum	$\frac{4}{4}$	$\frac{6}{4}$	$\frac{6}{4}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{2}{7}$	6	6	8	12

^a Three primary setae, one accessory seta, and one microchaeta on each side.

^b Setae *A 1* and *A 3* missing.

Eosentomon hunnicutti, new species

Figs. 11–20

Holotype. Female. Slide GSH 110-9. Chickasaw State Park, Tennessee, June 1965. Type Deposition: United States Natural History Museum, Washington, D.C.

Paratypes. 17♂♂, 18♀♀. One specimen sent to each of the following collections and/or individuals: American Museum of Natural History, New York, USA; Gentaro Imadate, Tokyo Medical and Dental University Kandai College, Chiba, Japan; Yin Wen-Ying, Shanghai Institute of Entomology, Academia Sinica, Shanghai, China; S. L. Tuxen Collection, Zoologisk Museum, Universitetsparken, 15DK, 2100 Copenhagen, Denmark; 30 paratypes retained in the University of Arkansas Insect Collection, Entomology Department, University of Arkansas, Fayetteville, Arkansas, USA.

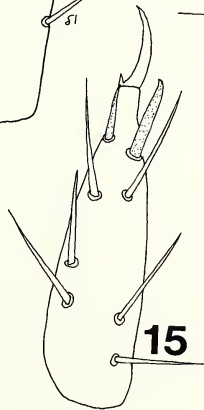
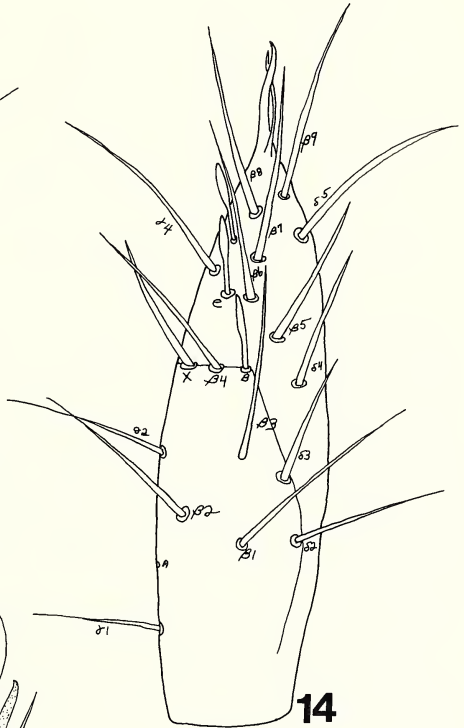
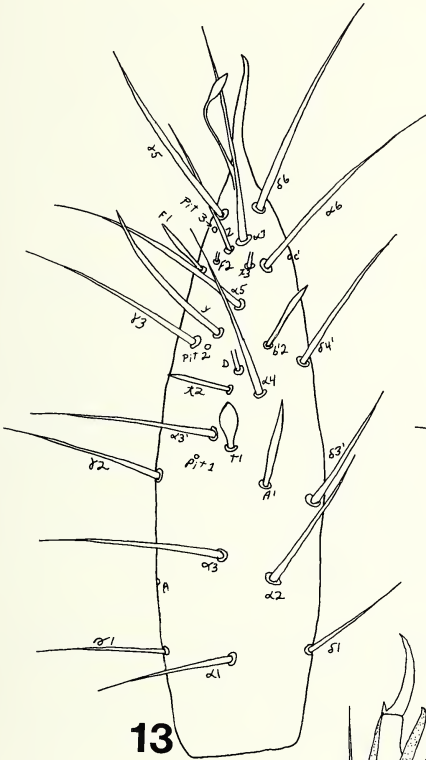
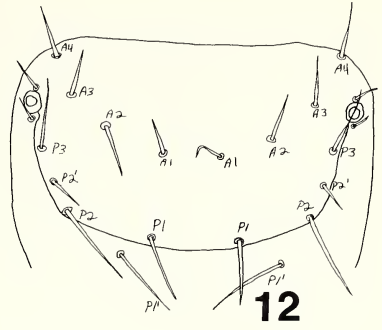
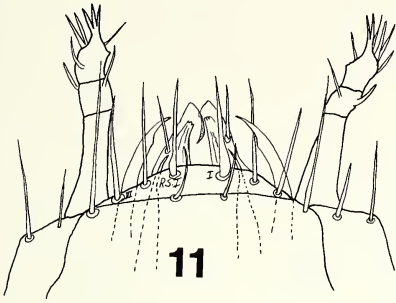
HEAD: Head capsule 103 microns long and 75 wide. Labrum (Fig. 11) 10 microns long with a broad V-shaped notch at its tip and a subterminal semilunar shaped apodeme. Labral setae present. Rostral setae I winged and slightly longer than the labrum. Rostral setae III shorter than rostral setae I (8:11 microns). Each mandible possessing three teeth. Clypeal apodemes prominent and connected anteriorly. Parts of the tentorium not distinct, cardo not as broad as the maxillary ramus. Head ratios: PR 225:14 = 16.1; LR 205:20 = 10.3.

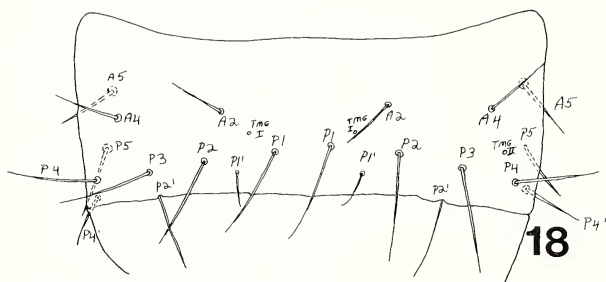
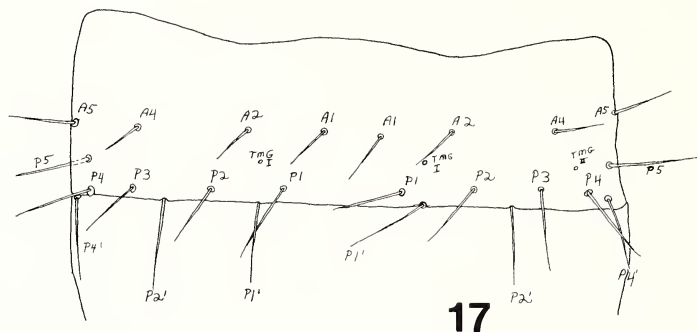
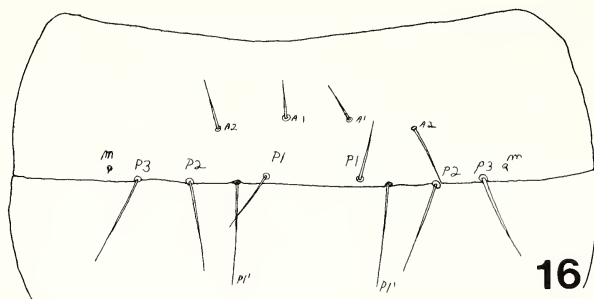
THORAX: Mesothoracic seta *P 1* (Fig. 12) length less than the distance to its homologue on the opposite side (15.25) and shorter than *P 1'*. The latter inserted in the unsclerotized posterior portion of the notum. Terminal bulbs of the *filamento di sostegno* in the prothorax.

TARSI: Foretarsus (Figs. 13, 14) 75 microns long and 23 microns wide at the broadest point. Sensillum *t 1* (Fig. 13) inserted proximal to seta $\alpha 3'$ but much closer to it than to $\alpha 3$ and possessing a large club with short shank. Sensillum *t 2* narrowly lanceolate with the length of the shank less than that of the blade and inserted on

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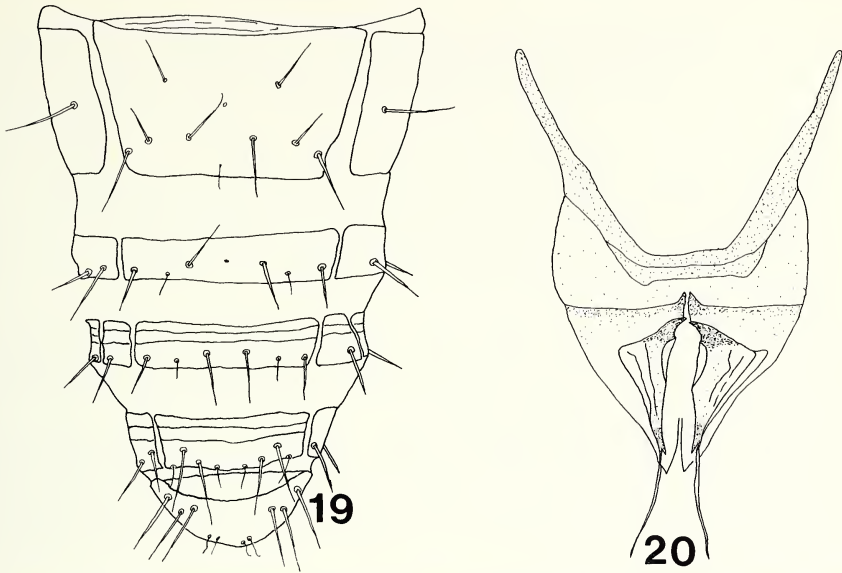
Figs. 11–15. *Eosentomon hunnicutti*. 11. Labrum and anterior portion of head. 12. Mesothorax; A1–A4, setae of the anterior row; P1–P3, setae of the posterior row. 13. Foretarsus (dorsal view); setae and sensilla as indicated. 14. Foretarsus (ventral view); setae and sensilla as indicated. 15. Tarsus III.





Figs. 16–18. *Eosentomon hunnicutti*. 16. Abdominal tergum I; A1–A2, setae of the anterior row; P1–P3, setae of the posterior row; M, microchaeta. 17. Abdominal tergum IV; A1–A5, setae of the anterior row; P1–P5, setae of the posterior row; TMG, tergal microgland pore. 18. Abdominal tergum VII; A2–A5, setae of the anterior row; P1–P5, setae of the posterior row; TMG, tergal microgland pore.

the level of seta α 4. Sensillum a' broadly lanceolate, length equalling the distance to sensillum t 3 (12:12 microns). Sensillum b' 1 absent. Sensillum b' 2 lanceolate and inserted on the level of γ 3. Sensillum f 1 very narrowly clavate-lanceolate. Club of sensillum s large and approximately twice the width of the shank. Sensillum e (Fig. 14) inserted on the level of seta β 6, possessing a large pointed club that is slightly longer than the shank. Sensillum g clavate with club longer than its shank and inserted proximal to β 8. Tarsal ratios: BS 81:65 = 1.24; EU 27.31 = 0.87.



Figs. 19, 20. *Eosentomon hunnicutti*. 19. Sterna VIII–XII; SMG, sternal microgland pores. 20. Female genitalia.

Metathoracic tarsus (Fig. 15) possessing a short empodium and the unguis with no teeth.

ABDOMEN: The posterior row of setae on tergum I (Fig. 16) with three primary setae, one accessory seta, and one microchaeta on each side. Setae *P 1* on tergum IV (Fig. 17) shorter than the *P 1'* (18:25). Setae *P 1'* on tergum VII (Fig. 18) filamentous and inserted midway between a line drawn connecting setae *P 1* and *P 2* and the posterior margin of the tergum. Two anterior and seven posterior setae on sternum VIII (Fig. 19). Sterna IX and X (Fig. 19) possessing six setae each. The abdominal chaetotaxy is shown schematically in Table 2.

GENITALIA: The female squama genitalis is represented in dorsal view in Figure 20. It shows no unusual features.

Table 2. Schematic representation of the abdominal chaetotaxy of *Eosentomon hunnicutti*.

Abdomen	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Tergum	$\frac{4}{10^a}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{8^b}{16}$	$\frac{8^b}{16}$	$\frac{8^b}{16}$	$\frac{6^c}{16}$	$\frac{6}{9}$	8	8	8	9
Sternum	$\frac{4}{4}$	$\frac{6}{4}$	$\frac{6}{4}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{2}{7}$	6	6	8	12

^a Three primary setae, one accessory seta, and one microchaeta on each side.

^b Setae *A 3* missing.

^c Setae *A 1* and *A 3* missing.

Discussion. Eighteen females and seventeen males were examined and no variations were found in: (a) the 3:1:1 and 2-7 arrangements of setae on tergum I and sternum VIII respectively, (b) the relative lengths of $P\ 1$ and $P\ 1'$ on tergum IV, (c) the insertion of sensillum $t\ 1$ slightly proximal to seta $\alpha\ 3'$, (d) sensillum a' length never greater than the distance to sensillum $t\ 2$ and, (e) sensillum g always inserted proximal to $\beta\ 8$. The terminal bulbs of the *filamento di sostegno* are in the prothorax of 33 specimens and near the anterior margin of the mesothorax in two specimens. These apparent discrepancies were probably caused by the two individuals being squashed in the mounting process. Rostral setae I are longer than their respective rostral setae III and winged in all but three individuals. The orientation of these three setae makes it impossible to determine if they are winged or not. The club of sensillum g on the holotype was positioned in a manner which made it impossible to show its shape; consequently, it has been drawn as it appeared on other individuals of this group. No setal abnormalities were noted.

Eosentomon hunnicutti is a member of the *wheeleri* group of Bonet and Tuxen (1960), and the 3:1:1 subgroup proposed by Copeland (1962). It is closely related to *E. chickasawensis*, differing chiefly in setae number in the anterior rows of terga IV-VI, *E. chickasawensis* having ten and *E. hunnicutti* eight setae per row per segment.

Distribution. Known only from the type locality, Chickasaw State Park, near Bolivar, Hardeman County, Tennessee.

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